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**BEFORE THE BOARD OF PATENT APPEALS
AND INTERFERENCES**

Application Number: 10/663,949
Filing Date: September 16, 2003
Appellant(s): RUKA ET AL.

John P. Musone
For Appellant

EXAMINER'S ANSWER

This is in response to the appeal brief filed 2/13/08 appealing from the Office action mailed 11/13/07.

(1) Real Party in Interest

A statement identifying by name the real party in interest is contained in the brief.

(2) Related Appeals and Interferences

The following are the related appeals, interferences, and judicial proceedings known to the examiner which may be related to, directly affect or be directly affected by or have a bearing on the Board's decision in the pending appeal:

Appeal 2007-4240

Application 10/663,949

Technology Center 1700

Decided October 31, 2007

Regarding the previous reversal by the Board of Appeals, new art was/is applied against the appealed claims.

(3) Status of Claims

The statement of the status of claims contained in the brief is correct.

(4) Status of Amendments After Final

The appellant's statement of the status of amendments after final rejection contained in the brief is correct.

(5) Summary of Claimed Subject Matter

The summary of claimed subject matter contained in the brief is correct.

(6) Grounds of Rejection to be Reviewed on Appeal

The appellant's statement of the grounds of rejection to be reviewed on appeal is substantially correct. The changes are as follows:

Appellant states on pages 2 (Status of Claims), pages 6, 7 and 8 (Appellant's Argument) that claims 1-4 and 16-17 are not appealed; however, under this section appellant lists claims 1-4 and 16-17 as appealed. Since appellant makes many positive statements of not appealing claims 1-4 and 16-17, the claims are being treated as not appealed.

(7) Claims Appendix

A substantially correct copy of appealed claims 5-15 & 18 appears on pages 16-17 of the Appendix to the appellant's brief. The minor errors are as follows: As discussed above, appellant has included claims 1-4 and 16-17 in the Claims Appendix even though the claims are not under appeal. However the inclusion of these claims seems appropriate since all of the appealed claims are dependent from the independent claim 1 and dependent claim 4.

(8) Evidence Relied Upon

5,589,285	CABLE et al.	12-1996
5,035,962	JENSEN	7-1991

Application of Plasma Spraying to Tubular-Type Solid Oxide Fuel Cells Production; H. Tsukuda, A. Notomi, N. Hisatome; Journal of Thermal Spray Technology; vol. 9, number 3; September 2000; pgs 364-368

R.M.C. Clemmer, S.F. Corbin, X. Qiao; "Influence of Nickel Distribution of the Processing and Properties of Porous Metal/Ceramic Composite Fuel Cells"; Processing and Fabrication of Advanced Materials X, ASM International 2001, 5-8 November 2001

INCO Company; Inco.com;
http://www.inco.comlcustomercentre/msdslpdflINCOFIBERNickelCoatedGraphite
Fiber- USMSDS.pdf
Rare Element Resources Ltd;
http://www.rareelementresources.com/s/Overview.asp

Answers.com; http://www.answers.comltopiclrare-earth-element

Periodic Table: Rare Earth; Chemical Elements.com; http://www. chemicalelements.comlgroupslrareearth.html

(9) Grounds of Rejection

It is noted that while claims 1-4 and 16-17 are not under appeal, these claims are include in the following ground of rejection so a complete understanding is obtained.

The following ground(s) of rejection are applicable to the appealed claims:

Claim Interpretation

The limitation of claim 1, “characterized by accumulated molten particle splats” is a product-by-process limitation. The final product, a fuel electrode, is not in a molten state and so the accumulation of molten particles is a process of reaching the final fuel electrode product that has a microstructure. As such, even though product-by-process claims are limited by and defined by the process, determination of patentability is based on the product itself. The patentability of a product does not depend on its method of production. If the product in the product-by-process claim is the same as or obvious from a product of the prior art, the claim is unpatentable even though the prior product was made by a different process (MPEP 2113). Applicant discloses on page 3 of the instant specification that the “microstructure generally characterized by accumulated molten particle splats" is attributed to plasma spraying (e.g. atmospheric plasma spraying "APS", vacuum plasma spraying "VPS", plasma arc spraying, flame spraying).

Admitted Prior Art

On page 3 and 4 of the instant specification, applicant discloses that plasma spraying (e.g. atmospheric plasma spraying "APS", vacuum plasma spraying "VPS", plasma arc spraying, flame spraying) is a well known method of fabricating the fuel electrode. This method is useful "to reduce fuel electrode fabrication costs”.

Claim Rejections - 35 USC § 102/103

The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

Claims 1-4, 9-12 & 15-17 are rejected under 35 U.S.C. 102(b) as anticipated by or, in the alternative, under 35 U.S.C. 103(a) as obvious over *Application of Plasma Spraying to Tubular-Type Solid Oxide Fuel Cells Production* (Tsukuda) as evidenced by applicant's known background art.

Tsukuda teaches a tubular solid oxide fuel cell with an air electrode, electrolyte and fuel electrode of ceramic-metal. The ceramic-metal fuel electrode is applied by plasma spraying and therefore, by applicant's admitted prior art and specification, inherently has a microstructure characterized by accumulated molten particle splats (Abstract, Sec. 1 on Pg. 364). The electrolyte is made of yttria-stabilized zirconia (YSZ) and the fuel electrode comprises nickel and zirconia (Table 1; Pg. 364, second column). An interconnector is used to connect a plurality of solid oxide fuel cells (Figs. 3 & 4).

Regarding claims 9-11, the process of using a nickel graphite mixture to obtain the nickel for the cermet is a product-by-process claim and even though product-by-process claims are limited by and defined by the process, determination of patentability is based on the product itself. The patentability of a product does not depend on its method of production. If the product in the product-by-process claim is the same as or

obvious from a product of the prior art, the claim is unpatentable even though the prior product was made by a different process (MPEP 2113). The final product taught claimed does not include the graphite since it is burned off during the sintering of the electrode, “nickel graphite powder (to provide the nickel, with the graphite burning out" (Page 13 of instant specification). The final fuel electrode taught by Tsukuda comprises nickel and zirconia, the same as the claimed product. Therefore, since the final product taught by Tsukuda is the same as the final product of the instant claims, Tsukuda anticipates the instant claims.

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

Claims 1-18 are rejected under 35 U.S.C. 103(a) as being unpatentable over US Patent 5,589,285 (Cable) as evidenced by applicant’s Admitted Prior Art.

Cable teaches a solid oxide fuel cell having a cathode of lanthanum manganite, an electrolyte with zirconia and 8 mole% of yttria, and an anode of nickel and zirconia (7:65-8:35, 10:18-20). The amount of nickel used is at least 60% and no more than 85% and the range for zirconia is more than 15% and less than 40% (16:1-20). The interfacial layer between the electrolyte layer and the anode layer is deposited by

plasma spraying (8:30-35). This interfacial layer is substantially made from the anode material.

Regarding claims 9-11, the process of using a nickel graphite mixture to obtain the nickel for the cermet is a product-by-process claim and even though product-by-process claims are limited by and defined by the process, determination of patentability is based on the product itself. The patentability of a product does not depend on its method of production. If the product in the product-by-process claim is the same as or obvious from a product of the prior art, the claim is unpatentable even though the prior product was made by a different process (MPEP 2113). The final product taught claimed does not include the graphite since it is burned off during the sintering of the electrode, “nickel graphite powder (to provide the nickel, with the graphite burning out" (Page 13 of instant specification). The final fuel electrode taught by Cable comprises nickel and zirconia, the same as the claimed product. Therefore, since the final product taught by Cable is the same as the final product of the instant claims, Cable teaches the same anode composition.

Regarding claims 16-18, a separator connects multiple fuel cells together to form a power generating system (14:44-68). A precursor layer, the interfacial layer, is formed on the fuel side. The layer is preferably 1-50 microns and made from a zirconia composition (8:25-10:18). The solid oxide fuel cell can be tubular in shape (1:55-57).

Cable is silent to the fuel electrode having microstructures characterized by accumulated molten particle splats.

Applicant admitted prior art teaches it is well known in the art to apply the fuel electrode using the plasma spray technique (Pgs. 3 & 4 of instant specification). The plasma spray technique provides the benefit of reducing the fabrication costs.

Therefore, it would have been obvious to one of ordinary skill in the art at the time the claimed invention was made to use a different method of applying the fuel electrode, as discussed by Cable, with the known plasma spray technique, as admitted by the prior art, to lower the fabrication costs of the fuel cell.

Claims 1-18 are rejected under 35 U.S.C. 103(a) as being unpatentable over US Patent 5,589,285 (Cable) in view of *Application of Plasma Spraying to Tubular-Type Solid Oxide Fuel Cells Production* (Tsukuda).

The teachings of Cable and Tsukuda as discussed above are incorporated herein.

Cable is silent to the fuel electrode having microstructures characterized by accumulated molten particle splats.

Tsukuda teaches using plasma spraying to apply the nickel-zirconia mixture for the fuel electrode (Abstract, Pgs. 364-365). Plasma spraying provides good performance for the fuel cell by improving the adhesion between each of the components of the fuel cell (Abstract; Pg. 365, second column). Plasma spraying also offers the deposition of a wide range of material compositions, so the mixing ratio of the metal to ceramic can easily be controlled, which in turn controls the coefficient of

thermal expansion (Pg. 366, second column). As noted above, plasma spraying inherently gives the microstructure characterized by accumulated molten particle splats.

Therefore it would have been obvious to one of ordinary skill in the art at the time the claimed invention was made to modify the fuel electrode application technique of Cable with the plasma spraying technique of Tsukuda to improve the adhesion between components and thereby improve the performance of the fuel cell. Furthermore, the coefficient of thermal expansion can be easily controlled by controlling the mixing ratios of the materials.

Claims 5-8 are rejected under 35 U.S.C. 103(a) as being unpatentable over *Application of Plasma Spraying to Tubular-Type Solid Oxide Fuel Cells Production* (Tsukuda).

The teachings of Tsukuda as discussed above are incorporated herein.

Tsukuda is silent to the percent of nickel and the percent of zirconia present in the fuel electrode composition.

Tsukuda teaches the metallic material for the fuel electrode is a nickel alloy cermet with yttria-stabilized zirconia (YSZ) or a nickel alloy with aluminum oxide (Table 1; Pg. 364, second column). Figure 7 illustrates the relationship of resistivity and the mixing ratio of nickel alloy with aluminum oxide, with the aluminum oxide varying between 20 – 80% (Fig. 7; Pgs. 365-366). This graph shows that varying the metal and ceramic mixture, an optimum resistance for the material can be obtained. Furthermore, the mixing ratio of the metal-ceramic material affects the coefficient of thermal

expansion and controlling this ratio allows the compatibility of the fuel cell layers with respect to the coefficient of thermal expansion. While Tsukuda is silent to the composition of the nickel-zirconia mixture, Tsukuda does teach altering the mixing ratio of an equivalent fuel electrode material to improve the conductivity and the matching of the coefficient of thermal expansion.

Therefore it would have been obvious to one of ordinary skill in the art at the time the claimed invention was made to modify the nickel-zirconia mixing ratio to optimize the conductivity and coefficient of thermal expansion, since it is held that discovering an optimum value of a result effective variable involves only routine skill in the art (MPEP 2144.05).

Claims 5-8 are rejected under 35 U.S.C. 103(a) as being unpatentable over *Application of Plasma Spraying to Tubular-Type Solid Oxide Fuel Cells Production* (Tsukuda) in view of US Patent 5,035,962 (Jensen).

The teachings of Tsukuda as discussed above are incorporated herein.

Tsukuda is silent to the percent of nickel and the percent of zirconia present in the fuel electrode composition.

Jensen teaches a fuel electrode for an SOFC having a graded composition structure formed by successively depositing layers of nickel-yttria stabilized zirconia mixtures with different compositions (Col. 3, ll. 6-9). Table 1 (Col. 9) gives the compositions of the layers on a volume basis. In order to convert the volume percentages to weight percentages, the following formula was used:

$$\text{Weight\%}_j = \frac{\text{Vol\%}_j(\text{Vol}_j + \text{Vol}_k)\rho_j}{[\text{Vol\%}_j(\text{Vol}_j + \text{Vol}_k)\rho_j] + \text{Vol\%}_k(\text{Vol}_j + \text{Vol}_k)\rho_k} = \frac{\text{Vol\%}_j\,\rho_j}{[\text{Vol\%}_j\,\rho_j + \text{Vol\%}_k\,\rho_k]}$$

The densities used were obtained from www.matweb.com for yttria stabilized zirconia and nickel. The following table lists the weight percents corresponding to the volume percents of Jensen's Table 1.

	Volume percent ZrO_2	**Weight percent ZrO_2**	**Volume percent Ni**	**Weight percent Ni**
Layer 1	70-90	63-87	10-30	13-37
Layer 2	40-60	33-53	40-60	47-67
Layer 3	10-30	7.6-24	70-90	76-92.3

As can be seen from the table Jensen teaches minimums of about 60% Ni and about 15% YSZ (claim 5) and about 70% Ni and about 20% YSZ (claim 6). Jensen also teaches maximums of about 85% Ni and about 50% YSZ (claim 7) and about 80% Ni and about 30% YSZ. The compositions of the individual layers of the multiple layer graded structure approximate a layer in which the composition is continuously graded from being high in zirconia at the electrolyte interface to being high in nickel at the external surface of the anode and meets the simultaneous requirements of adhesion of the yttria stabilized zirconia electrolyte and adequate electrode electrical conductivity.

Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to have used the fuel electrode compositions as taught by Jensen in the fuel cell as taught by Tsukuda to meet the simultaneous requirements of

adhesion of the yttria stabilized zirconia electrolyte and adequate electrode electrical conductivity.

Claims 9-11 are rejected under 35 U.S.C. 103(a) as being unpatentable over *Application of Plasma Spraying to Tubular-Type Solid Oxide Fuel Cells Production* (Tsukuda) in view of *Processing and Properties of Porous Ni-YSZ Metal/Ceramic Composites* (Clemmer), as evidenced by INCO, Ltd.

The teachings of Tsukuda as discussed above are incorporated herein.

Tsukuda fails to teach that at least a portion of nickel in the fuel electrode is obtained from nickel graphite powder.

Clemmer teaches Ni/yttria-stabilized zirconia fuel cell anodes in which Ni-coated graphite particles (55% Ni content; obtained from INCO, Ltd.: Pg. 233) were used as a starting material. Generally, the anodes created from the Ni-coated graphite particles had a lower coefficient of thermal expansion and higher electrical conductivity for a given Ni loading compared to the anodes made of separate Ni and graphite particles. The hybrid structures had intermediate values of coefficient of thermal expansion and electrical conductivity (Abstract).

Nickel coated graphite particles available from INCO contain either 60 or 75% (www.incosp.com).

Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to have used Ni-coated graphite particles, such as those available from INCO, as a starting material for Ni/yttria-stabilized zirconia fuel cell

anodes as taught by Clemmer in the fuel cell as taught by Tsukuda in order to achieve lower coefficient of thermal expansion and higher electrical conductivity for a given Ni loading.

Claim 18 is rejected under 35 U.S.C. 103(a) as being unpatentable over *Application of Plasma Spraying to Tubular-Type Solid Oxide Fuel Cells Production* (Tsukuda) in view of US Patent 5,589,285 (Cable).

The teachings of Tsukuda as discussed above are incorporated herein; however, the reference is silent to the precursor layer between electrolyte and fuel electrode containing zirconia.

Cable teaches an SOFC with a cathode containing lanthanum manganate (Col. 7, l 66 – Col. 8, l 2), an electrolyte of yttria-stabilized zirconia (Col. 8, ll. 12-14), and an anode containing a nickel powder mixed with zirconia (Col. 10, ll. 18-20). Between the electrolyte and anode, an interfacial layer (applicant's precursor layer) containing sulfur tolerant material is disposed (Col. 3, ll. 1-3); the interfacial layer may contain Y-doped ZrO_2 (Col. 10, ll. 1-4; applicant's zirconia). The thickness of the interfacial layer is generally 1-100 μm, preferably less than 50 μm (Col. 8, ll. 35-37). The interlayer serves to improve electrical contact between the electrolyte and anode and provides an environment in which the species can interact or react because the interlayer keeps sulfur from the fuel from poisoning the anode, particularly Ni/YSZ cermet anodes (Col. 8, ll. 19-34; Col. 6, ll. 55-63; Col. 18, ll. 23-29).

Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to have included the Y-doped zirconia interlayer as taught by Cable between the anode and the electrolyte of the fuel cell as taught by Tsukuda in order to improve electrical contact and provide an environment in which the species can interact or react.

(10) Response to Argument

Tsukuda and claims 9-11:

Appellant states the product-by-process interpretation for claims 9-11 are a “new interpretation" that have "never previously set forth". However, the Non-Final office action of 8/25/06 that was subsequently appealed on 10/31/06 included the same interpretation. In the appeal brief of 10/31/06, appellant never disputed the product-by-process interpretation of the same claims 9-11. As discussed in the above rejection, the interpretation is based on appellant's instant specification page 13, where appellant teaches the final product does not include the graphite because it is burned off during the sintering process of the electrode. The final product taught by Tsudaka comprises nickel and zirconia, the equivalent product claimed by appellant.

Appellant argues on page 7 of the brief, "since the term "nickel graphite powder" recites the structural end of the nickel portion of the fuel electrode, it is properly held as structure - not process." First, 'nickel graphite powder' is not the structural end of the nickel portion of the fuel electrode, but in fact the reverse. Nickel is the structural end of the nickel graphite powder, as discussed by appellant's instant specification on page 13.

Second, it isn't 'nickel graphite powder' per se that forms the process but the whole claim of "nickel graphite powder <u>is used to obtain</u> at least a portion of the nickel."

Regarding the arguments of claim 12, appellant argues "Claim 12 recites that a yttria stabilized zirconia powder is used to obtain at least a portion of the zirconia element of the electrolyte." However, claim 12 depends from claim 4, which deals with the <u>electrode</u>, not the electrolyte, and the zirconia is part of the <u>electrode</u>, which is addressed in the rejections. In fact, appellant is not appealing claim 4, meaning the <u>final product</u> taught by Tsudaka is equivalent to the claimed invention.

Appellant argues the rare-earth element stabilized zirconia of claim 15 is not taught by the prior art since only yttria stabilized zirconia is taught and yttrium is not considered a rare-earth element according to Chemical Elements.com web page showing the Periodic Table of Rare Earth elements. However, <u>no definition of the rare-earth elements was provided in the instant specification</u>. Yttrium and Scandium are well known rare-earth elements. The following definitions provided show that Yttrium and Scandium are rare-earth elements:

From *Science and Technology Encyclopedia,* The group of 17 chemical elements with atomic numbers 21, 39, and 57-71; the name lanthanides is reserved for the elements 58-71.

From *Britannica Concise Encyclopedia,* Any of a large class of chemical elements including scandium (atomic number 21), yttrium (39), and the 15 elements from 57 (lanthanum) to 7i.

From *Columbia University Press,* in chemistry, group of metals including those of the lanthanide series and actinide series, usually yttrium, sometimes scandium and thorium, and rarely zirconium.

From *Wikipedia,* "Rare earth elements" and "rare earth metals" are trivial names sometimes applied to a collection of sixteen chemical elements in the periodic table, namely scandium, yttrium, and fourteen-of the fifteen lanthanides (excluding promethium), which naturally occur on the Earth. The former two are included as they tend to occur with the latter in the same ore deposits. Some definitions additionally include the actinides.

From *Rare Element Resources LTD,* The rare-earth elements are the 15 lanthanide-series elements, with atomic numbers 57 through 71, which are in Group IIIA of the Periodic Table. Yttrium (atomic number 39), a Group IIIA transition metal, although not a lanthanide is generally included with the rare-earth elements, as it occurs with them in natural minerals and has similar chemical properties. Also, commonly included with the rare-earth elements because of their similar properties are scandium (atomic number 21 and thorium (atomic number 90).

Therefore, since no definition of rare earth elements is provided by the appellant in the instant specification, the common definition of a rare-earth element, which is well known in the art, is used. The above resources provide evidence that yttrium, as taught by Tsudaka, <u>is</u> a rare-earth element.

Claims rejected under 35 USC 103(a) under Tsukuda:

Appellant's arguments are only a reiteration of the arguments presented above under the 35 USC 102(b) rejection. Regarding claims 9-11, these are product-by-process claims since the claim is a product and the method of forming the product doesn't patentably distinguish the final product from the final product of the prior art, as acquiesced by appellant not appealing claim 4. Regarding claim 12, this claim is drawn to an <u>electrode,</u> not an electrolyte and again as stated above, the final product of claim 4 has zirconia in it. Furthermore, even though the method of obtaining the zirconia in the electrode isn't a patentably distinguishing process for the final product, Tsukuda teaches yttria stabilized zirconia in the fuel electrode (pg. 364, 2nd paragraph). Regarding claim 15, the rare-earth element is discussion is the same as above.

Claims 1-18 rejected under 35 USC 103(a) under Cable:

Appellant points out that this rejection was overturned by the Board of Appeals on the Decision of 10/31/07. In that decision, the Board determined that while plasma deposition was taught by Cable, "There is no disclosure that 'plasma deposition' includes plasma spraying" (Decision pg. 6). However, as will be discussed below, Cable teaches plasma spraying as an application technique (12:29-35). On page 8 of the instant brief, appellant "respectfully request the Examiner to cite were Cable supposedly provides this discussion." Cable teaches plasma spraying as an application technique (12:29-35). As discussed in the rejection, Cable teaches applying an interfacial layer that comprises the <u>fuel electrode</u> (anode) material (3:13, 3:23, and 6:55-

61) by plasma deposition or screen printing (8:32-35). Cable also teaches a microslip layer that is applied between the interfacial layer and the anode layer. This microslip layer is also comprised of anode (fuel electrode) material (10:59-65) and can be an integral or continuous layer with the bulk electrode (i.e., anode) (11:4-10). The microslip layer is applied by screen printing or plasma spraying (12:29-35). So, Cable teaches an interfacial layer having a material equivalent to the anode material and can be applied by plasma deposition, which is shown to be a known equivalent method, by way of screen printing, to plasma spraying. Cable teaches another layer, the microslip layer, which also is made of the anode material and is taught to be applied by plasma spraying. Page 3 of Appellant's instant specification, teaches, "Other attempts to reduce fuel electrode fabrication costs include plasma spraying ... to form a deposited layer having a microstructure generally characterized by accumulated molten particle splats." So, appellant teaches that the plasma spraying technique has been known in the art and it has been known for application of the fuel electrode. Appellant goes on to say that applying the fuel electrode by plasma spraying has resulted in problems such as poor adhesion and thermal expansion mismatch (Instant specification pg. 4).

So, Cable teaches plasma spraying the interfacial layer and the microslip layer, both having the same material as the anode, and that these layers aid in adhering the anode to the electrolyte and provide a better thermal expansion match between layers (11:49-60). Combining Cable's teachings with that which is known in the art, namely plasma spraying of the fuel electrode and that plasma spraying reduces fabrication costs, as discussed by appellant, it would be obvious to one skilled in the art to use

plasma spraying to apply the anode material for the tubular solid oxide fuel cell of Cable.

Furthermore, appellant admits that Cable teaches a superior method of applying the anode material by plasma spraying. On page 10 of the instant brief, appellant alleges no motivation for a combination of references. Appellant argues the skilled artisan would not use Tsukuda's 'reliable' method of applying the anode material over "Cable's adhesion superior deposition technique" (Brief pg. 10). The only deposition technique taught by Cable is plasma deposition (8:33), which as discussed above includes plasma spraying. So appellant admits that Cable teaches a superior method of applying anode material by plasma spraying. As such, the instant claims are at least obvious over the teachings of Cable.

Appellant argues that Cable teaches away from a tubular design since a planer fuel cell is exemplified for use with sulfur bearing fuels. First, Cable doesn't teach away from tubular fuel cells as a structure for solid oxide fuel cells. Cable teaches that cofired or bonded solid electrolyte fuel cells are not tolerant of using sulfur bearing fuels (2:3-5). These cofired or bonded solid electrolyte fuel cells, as taught by Isenberg et. al., are <u>preferably</u> tubular in shape. Second, Cable teaches that the sulfur tolerant fuel cells are <u>preferably</u> planer, not that they must be planer. "*Disclosed examples and preferred embodiments do not constitute a teaching away from a broader disclosure or nonpreferred embodiments*." (MPEP 2132 (II)). Further, appellant's arguments are not commensurate in scope with the claims. <u>None</u> of the claims recite the solid oxide fuel cell must be tolerant to sulfur bearing fuels.

Cable in view of Tsukuda:

Appellant argues the motivation to combine Tsukuda's plasma spraying with Cable's solid oxide fuel cell is misplaced because allegedly Tsukuda's plasma spraying is only ‘reliable'. First, 'reliable' is a great improvement over something that isn't reliable. Second, Tsukuda actually teaches, "The application of plasma spraying to tubular SOFC production has resulted in cells with good performance" (Abstract, pg. 368 - Conclusions). As discussed above, appellant alleges no motivation to use Tsukuda's 'reliable' method of applying the anode material over "Cable's adhesion superior deposition technique" (Brief pg. 10). The only deposition technique taught by Cable is plasma deposition (8:33), which as discussed above includes plasma spraying. So appellant admits that Cable teaches a superior method of applying anode material by plasma spraying. As such, the instant claims are at least obvious over the teachings of Cable in view of Tsukuda.

Claims 5-8 rejected under 35 USC 103(a) over Tsukuda:

Appellant argues a particular parameter is not established by Tsukuda for the results effective variable argument and that “Examiner has not met the burden of showing that nickel-zirconia percentage limitations are recognized as results effective variables”. Tsukuda shows in Figure 7 and the last paragraph of page 365, the relation between the mixing ratio of Al_2O_3 to Ni alloy and the resistivity of the coating. In other

words, the results effective variable of as the mixing ratio changes so does the resistivity of the material. Table 1 on page 365 relates the different possible fuel electrodes can be either a Ni- Al_2O_3 cermet or a Ni-ZrO_2 cermet (appellant's anode material). On page 366, Tsukuda teaches, "Since the coefficient of linear thermal expansion is proportional to the mixing ratio of metal to ceramic [cermet], control of this ratio allows the achievement of both compatibility between the coefficients of linear expansion and acceptable conductivity." This teaching is a prime example of results effective variable.

Claims 5-8 rejected under 35 USC 103(a) over Tsukuda in view of Jensen:

Appellant argues the combination is illogical and confusing based on previous rejections, the fact that Jensen assigned his invention to the appellant and that the final product would be a graded electrode made by sintering. It is unclear exactly how to address these arguments since they are not commensurate with the rejection presented. One, the fact that Jensen assigned the invention to the appellant doesn't lessen it as prior art or the teachings it presents. Two, claims 5-8 are rejected over Tsukuda in view of Jensen, without mention of Cable. So the arguments with respect to the combination of Cable are unclear since that isn't the rejection presented. Three, while Jensen teaches sintering as one possible application method, spraying is also taught as an application method (5:27-28). Further, Jensen teaches an electrode composition that improves the fuel cell performance by meeting the simultaneous requirements of adhesion of the yttria stabilized zirconia electrolyte and adequate

electrode electrical conductivity (4:20-25). This is the reason and motivation for using the teachings of Jensen. Therefore, the arguments are not commensurate in scope with the rejection presented and the rejection meets the limitations of the claims and so renders the instant claims obvious. Appellant alleges claims 6 and 8 are not met. However, looking at the table presented in the Jensen rejection, at least layer 3 reads on claim 6 and layers 3 and 2 read on claim 8.

Claims 9-11 rejected under 35 USC 103(a) over Tsukuda in view of Clemmer:

Appellant argues Clemmer teaches nickel coated graphite not "separate Ni and graphite particles". This argument is not commensurate in scope with the claims since "separate Ni and graphite particles" is not recited in the claims. Regarding appellant's request to clarify the rational behind the amount of nickel in the nickel graphite powder, it would be obvious to one skilled in the art that the higher the nickel content in the powder, the more nickel that will be applied per volume of material. The lower the nickel content the less nickel applied per volume of material. This could affect the porosity of the electrode since the graphite is burned out leaving a void. Therefore, it would be obvious to one skilled in the art to choose the nickel content based on parameters such as porosity.

Claim 18, Tsukuda in view of Cable:

No new arguments are presented and so the same answer as presented above applies here.

(11) Related Proceeding(s) Appendix

Copies of the court or Board decision(s) identified in the Related Appeals and Interferences section of this examiner's answer are provided herein.

For the above reasons, it is believed that the rejections should be sustained.

Respectfully submitted,

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